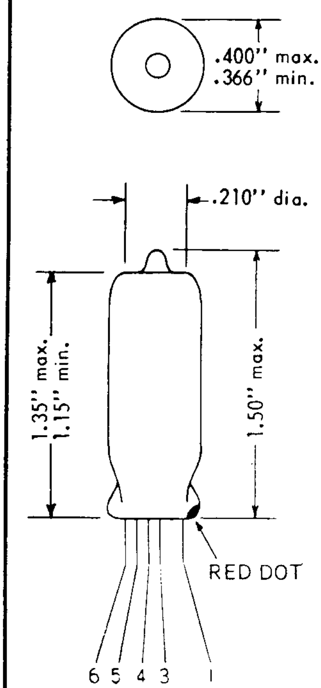
RAYTHEON

Excellence in Electronics

RELIABLE SUBMINIATURE TRIODE

TYPE CK5703WB



The CK5703WB is a heater-cathode type medium-mu triode of subminiature construction capable of operation as an oscillator, Class C Amplifier, or frequency multiplier in the UHF region. This type is characterized by long life and stable performance. It is designed for service where conditions of high temperature and mechanical shock or vibration are encountered. The flexible terminal leads may be soldered or welded directly to the terminals of circuit components without the use of sockets. Standard inline subminiature sockets may be used by cutting the leads to a suitable length.

MECHANICAL DATA

ENVELOPE: T-3 Glass

BASE: None (0.016" tinned flexible leads. Length: 1.5" min.
Spacing: 0.048" center-to-center
except leads 1-3=0.096" center-to-center)

TERMINAL CONNECTIONS: *(Red Dot is adjacent to lead 1)*

Maximum Impact Acceleration (Shock Test-Note 3)	450 G
Maximum Uniform Acceleration (centrifuge Test-Note 4)	1000 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test-Note 5)	2.5 G
Maximum Bulb Temperature	220 °C

MOUNTING POSITION: Any

ELECTRICAL DATA

CAUTION-To Electronic Equipment Design Engineers: Special attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

RATINGS AND NORMAL OPERATION:	MIL-E-1 SYMBOL	DESIGN MINIMUM	NORMAL TEST CONDITIONS (Note 7)	NORMAL OPERATION (Note 6)	DESIGN MAXIMUM	MIL-E-1 UNITS
Heater Voltage (Note 8)	Ef:	5.7	6.3	6.3	6.9	V
Plate Voltage	Eb:	----	120	120	200	Vdc
Grid Voltage	Ec1:	----	0	0	----	Vdc
Plate Dissipation	Pp:	----	----	1.1	1.35	W
Heater-Cathode Voltage	Ehk:	-200	----	100	+200	v
Plate Current	Ib:	----	----	9.4	15	mAdc
Grid Current	Ic1:	----	----	----	5.5	mAdc
Cathode Resistance	Rk:	----	220	220	----	ohms
Grid Circuit Resistance	Rg:	----	----	----	1.2	Meg.
Transconductance (1)	Sm(1):	----	----	5000	----	µmhos
Amplification Factor	Mu:	----	----	25.5	----	----

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS PART 1		**Combined AQL = 1.0% excluding Mechanical and Inoperatives**								
Heater Current:		0.65	If:	190	----	200	----	210	----	mA

Tentative Data

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS PART 1 (cont'd)										
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc	0.65	Ihk: Ihk:	---- ----	---- ----	---- ----	---- ----	5 5	---- ----	µAdc µAdc
Grid Current:		0.65	Ic (1):	----	----	----	----	−0.3	----	µAdc
Plate Current (1):		0.65	Ib (1):	7.3	8.6	9.4	10.2	11.5	2.5	mAdc
Plate Current (2):	Ec1=−8.5 Vdc	0.65	Ib (2):	----	----	----	----	50	----	µAdc
Transconductance (1):		0.65	Sm (1):	4300	4700	5000	5300	5700	1050	µmhos
Continuity and Shorts (Inoperatives)		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope (8−7) (Note 10)	----	----	----	----	----	----	----	----	----
MEASUREMENTS ACCEPTANCE TESTS PART 2										
Insulation of Electrodes:	Ef=6.3 V Eg-all=−100 Vdc Ep-all=−300 Vdc	2.5	Rg1−all: Rp−all:	250 250	---- ----	---- ----	---- ----	---- ----	---- ----	Meg. Meg.
Plate Current (3):	Ec1=−5 Vdc	2.5	Ib (3):	20	----	----	----	----	----	µAdc
Transconductance (2):	Ef=5.7 V (Note 9)	2.5	Δ_{Ef} Sm (2):	----	----	----	----	5	----	%
Grid Emission:	Rg=1.0 meg.; Ef=7.5 V; Preheat 5 minutes at Ec1=0; Test at Ec1=−10 Vdc.	6.5	Ic (2):	----	----	----	----	−0.4	----	µAdc
AF Noise:	Esig=50 mVac; Ec1=−4.5 Vdc; Rp=0.01 Meg.; Rg1=0.1 Meg.; Rk=0	2.5	EB:	----	----	----	----	17	----	VU
Pulse Emission:	Ef=6.0 V; e pulse=50 v; tp=25 µsec.; Prr=200 pps	6.5	is:	300	----	----	----	----	----	ma.
Power Oscillation:	F=500 Mc; Eb=150 Vdc; Rg/Ib=20 mAdc	6.5	Po:	600	----	----	----	----	----	mw
Amplification Factor:		6.5	Mu:	22.5	----	25.5	----	28.5	----	----
Capacitance:			Cgp:	1.0	----	1.3	----	1.6	----	µµf
Capacitance:	(Note 2)	6.5	Cin:	2.0	----	2.6	----	3.2	----	µµf
Capacitance:			Cout:	0.65	----	0.85	----	1.05	----	µµf
Low Pressure Voltage Breakdown:	Pressure=55±5 mm Hg; Voltage=300 Vac	6.5	----	----	----	----	----	----	----	----
Operation Time:	(Note 11)	4.0	t:	----	----	----	----	20	----	sec.
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	2.5	Ep:	----	----	----	----	10	----	mVac
Vibration (3):	F=30−1000 cps; G=15; Rp=10,000; t=3 min.; position X_1 and X_2 only.	4.0	ep:	----	----	----	----	50 peak to peak	----	mv
DEGRADATION RATE ACCEPTANCE TESTS										
Subminiature Lead Fatigue:		2.5	----	4.0	----	----	----	----	----	arcs
Shock (1):	Hammer Angle=30°; Ehk=+100 Vdc; Rg1=0.1 Meg.; (Note 3)	20	----	----	----	----	----	----	----	----
Fatigue (1):	96 Hours; G=2.5; Fixed frequency; F=25 min. 60 max. (Note 5)	6.5	----	----	----	----	----	----	----	----
Fatigue (2):	6 Hours; G=10; Fixed frequency; F=25 min. 60 max. (Note 12)	6.5	----	----	----	----	----	----	----	----

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)(cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
DEGRADATION RATE ACCEPTANCE TESTS								
Post Shock (1) and Fatigue Tests (1) and (2) End Points:								
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	----	Ep:	----	20	mVac		
Heater-Cathode Leakage:	Ehk=+100 Vdc	----	Ihk:	----	10	μAdc		
	Ehk=−100 Vdc	----	Ihk:	----	10	μAdc		
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	Δ_t Sm (1):	----	10	%		
Grid Current (1):		----	Ic (1):	----	−1.0	μAdc		
Shock (2):	75 G; (hammer angle=120°+rubber pad); t=10 milliseconds (note 13) Ehk=+100 Vdc; Rg1=0.1 Meg.	20	----	----	----	----		
Post Shock Test (2) End Points:								
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	----	Ep:	----	15	mVac		
Heater-Cathode Leakage:	Ehk=+100 Vdc	----	Ihk:	----	10	μAdc		
	Ehk=−100 Vdc	----	Ihk:	----	10	μAdc		
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	Δ_t Sm (1):	----	10	%		
Grid Current (1):		----	Ic (1):	----	−1.0	μAdc		
Glass Strain (Thermal Shock)		6.5	----	----	----	----		
ACCEPTANCE LIFE TESTS								
Heater Cycling Life Test:	Ef=7.5 V; Eb=Ec1=0 V; Ehk=140 Vac; 1 min. on, 1 min. off	1.0	----	2000	----	cycles		
Heater Cycling Life T End Points:								
Heater-Cathode Leakage:	Ehk=+100 Vdc	----	Ihk:	----	20	μAdc		
	Ehk=−100 Vdc	----	Ihk:	----	20	μAdc		
1 Hour Stability Life Test:	TA=Room; Ehk=+200 Vdc; Rg1=1.0 Meg.	----	----	----	----	----		
1 Hour Stability Life Test End Points:								
Change in Transconductance (1) of individual tubes:	(Typical Sample Size=50 tubes)	1.0	Δ_t Sm (1):	----	10	%		
100 Hour Survival Rate Life Test:	TA=Room; Ehk=+200 Vdc; Rg=1.0 Meg.	----	----	----	----	----		
100 Hour Survival Rate Life Test End Points:	(Typical Sample Size=200 tubes)	----	----	----	----	----		
Inoperatives:		0.65	----	----	----	----		
Transconductance (1):		1.0	Sm (1):	3800	----	μmhos		
Intermittent High Temperature Life Test:	T Bulb=220°C; Ehk=+200 Vdc; Rg=1.0 Meg.	----	----	----	----	----		

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)(cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
ACCEPTANCE LIFE TESTS (Cont'd)								
500 Hour Intermittent High Temperature Life Test End Points:	(Typical Sample Size= 20 tubes 1st sample, 40 tubes 2nd Sample)	----	----	----	----	----		
Inoperatives:		----	----	----	----	----	1	3
Grid Current (1):		----	Ic (1):	----	−0.6	μAdc	1	3
Heater Current:		----	If:	180	220	mA	1	3
Change in transconductance (1) of individual tubes:		----	Δ_t Sm (1):	----	20	%	1	3
Transconductance (2):	(Note 9)	----	Δ_{Ef} Sm (2):	----	15	%	2	5
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc	---- ----	Ihk: Ihk:	---- ----	10 10	μAdc μAdc	2	5
Insulation of Electrodes: g1−all p−all		---- ----	Rg1−all: Rp−all:	50 50	---- ----	Meg. Meg.	2	5
Transconductance (1) Average Change:		----	Avg. Δ_t Sm(1):	---	15	%	---	---
Total Defectives:		----	----	----	----	----	4	8
1000 Hour Intermittent High Temperature Life Test End Points:	(Typical Sample Size= 20 tubes 1st sample, 40 tubes 2nd sample)	----	----	----	----	----	---	---
Inoperatives:		----	----	----	----	----	2	5
Grid Current (1):		----	Ic (1):	----	−1.0	μAdc	2	5
Heater Current:		----	If:	177	223	mA	2	5
Change in transconductance (1) of individual tubes:		----	Δ_t Sm (1):	----	30	%	2	5
Heater−Cathode Leakage:	Ehk=+100 Vdc Ehk=−100 Vdc	---- ----	Ihk: Ihk:	---- ----	15 15	μAdc μAdc	2	5
Total Defectives:		----	----	----	----	----	5	10

NOTES

Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1 "Inspection Instructions for Electron Tubes," and MIL-STD-105A.

Note 2: Without shield.

Note 3: Test conditions and acceptance criteria per Shock Test procedures of MIL-E-1 basic specifications.

Note 4: Centrifuge Test with forces applied in any direction.

Note 5: Test conditions and acceptance criteria per Fatigue Test procedures of MIL-E-1 basic specifications.

Note 6: These normal values represent conditions at which control of reliability may be expected.

Note 7: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.

Note 8: For most applications the performance will not be adversely affected by ±10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

Note 9: Change of transconductance for individual tubes from that value measured at Ef=6.3 V to that value measured at Ef=5.5 V.

Note 10: In addition to meeting the tightened electrical, physical, and mechanical tests described in this data sheet, these Raytheon Reliable tubes are now guaranteed to be free from "Potential" defects identifiable by microscopic inspection as described by appendix B of "Inspection Instructions for Electron Tubes".

Note 11: Operation time is the time in seconds required for the plate current to attain a value within plus or minus 10 percent of the three minute plate current (1) value. No preheating before this test will be allowed.

ELECTRICAL DATA (cont'd)

NOTES (cont'd)

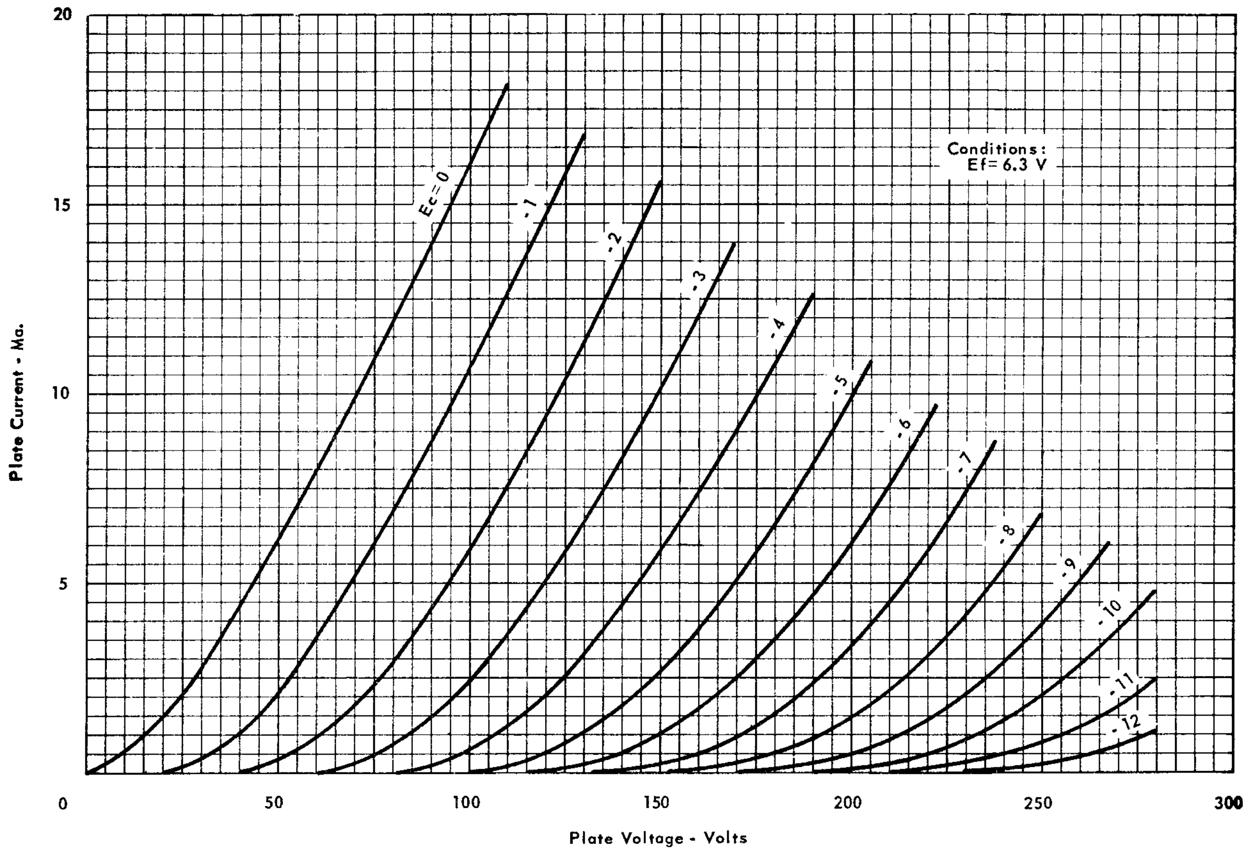
Note 12: The tubes shall be rigidly mounted on a table vibrating with simple harmonic motion. The tubes shall be vibrated for a total of 6 hours, 2 hours in each of three positions, X1, X2, Y1. Only rated heater voltage shall be applied. Tubes which show one or more of the following defects shall be considered failures:

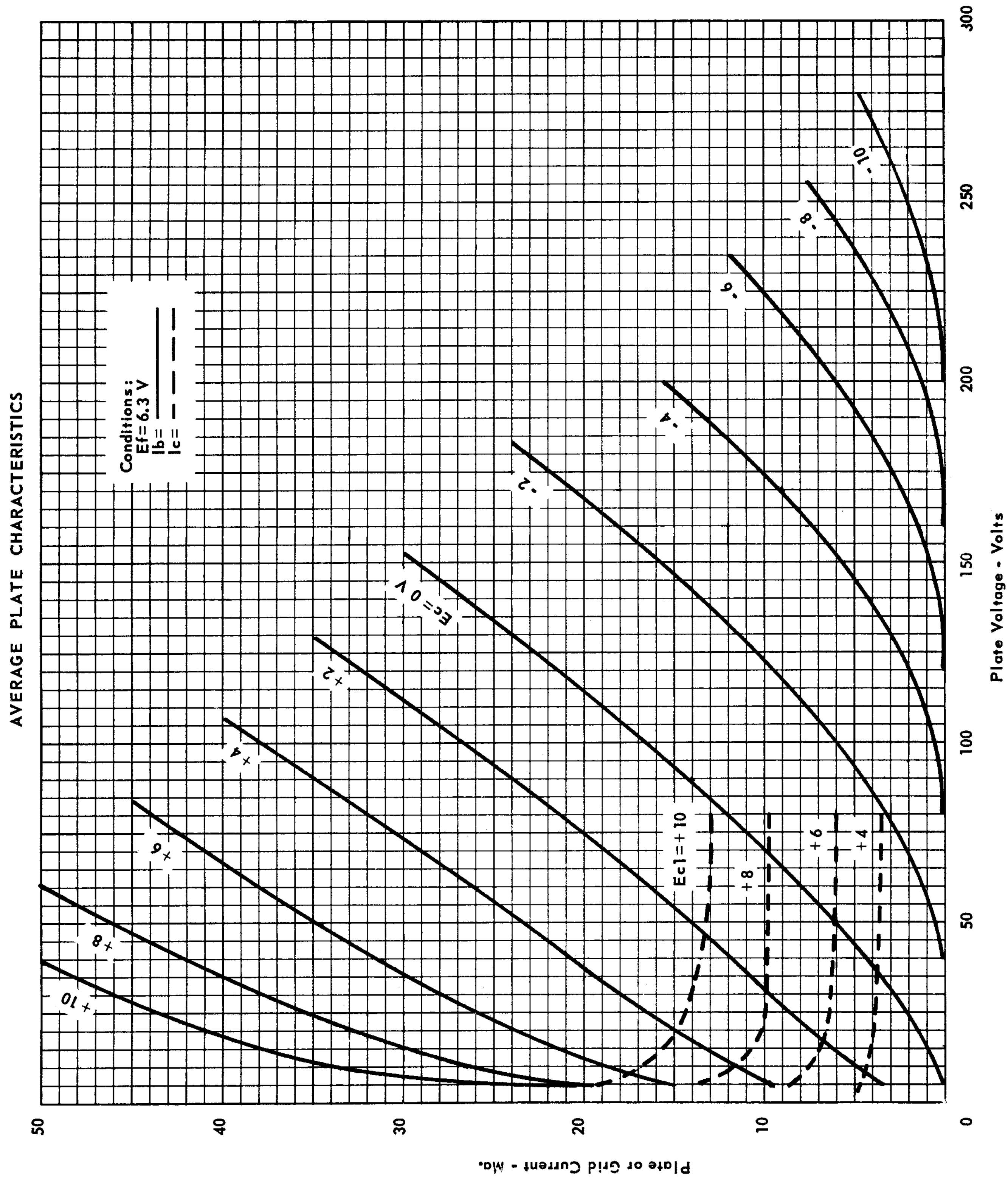
(a) Tubes which show permanent or tap shorts or open circuits following fatigue test, when tested as specified in paragraph 4.7.2 and 4.7.3 of Specification MIL-E-1.

(b) Tubes which do not comply with post fatigue limits. This is a destructive test.

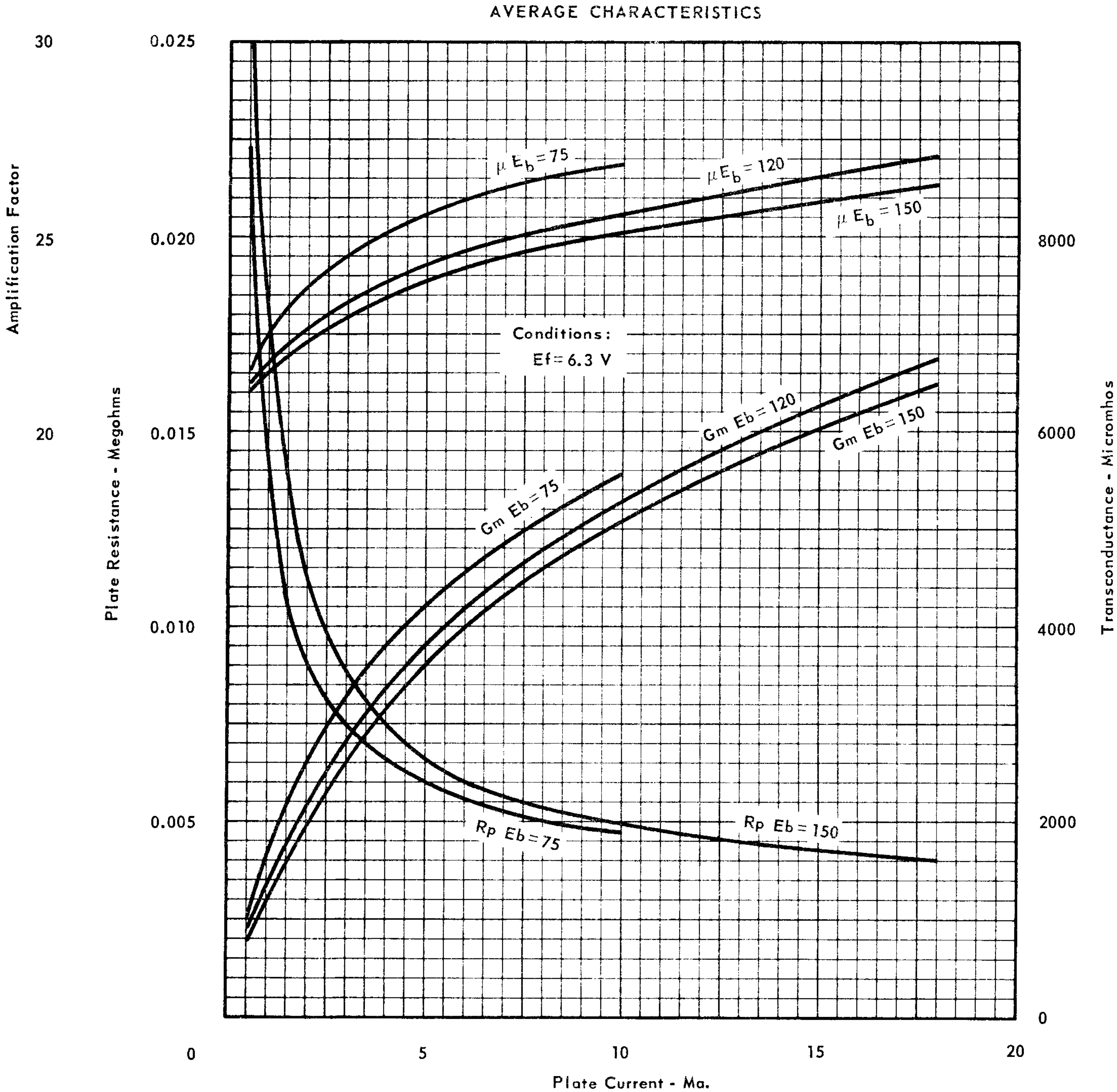
Note 13: The provisions of paragraph 4.9.20.5 of Specification MIL-E-1 shall apply, except for test conditions listed for shock test (2).

AVERAGE PLATE CHARACTERISTICS




AVERAGE PLATE CHARACTERISTICS
Conditions:
Ef = 6.3 V
Ib =
Ic =
Ec = 0 V
+ 2
+ 4
+ 6
+ 8
+ 10
- 2
- 4
- 6
- 8
- 10
Ec1 = + 10
+ 8
+ 6
+ 4
Plate Voltage - Volts
Plate or Grid Current - Ma.
0
50
100
150
200
250
300
10
20
30
40
50

RELIABLE SUBMINIATURE TRIODE



AVERAGE CHARACTERISTICS

